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Method for Heating a Roller

This invention relates to a method for heating a roller used in the production and/or finishing of a web of material, particularly a paper web or paperboard web.

The object of the present invention is to create an improved method of the type initially referred to. In particular the use of renewable fuels should also be possible.

This object is accomplished in accordance with the invention in that the roller is heated from the outside by a heated gas. In this case the heat gas is generated preferably by means of at least one burner arranged near the roller surface. The heat gas emerging from the burner can then act on the surface of the rotating roller.

Hence the heat is generated where it is required. Furthermore, renewable energies can now be used to generate the heat required.

According to a preferred practical embodiment of the method according to the invention, the roller is heatable on a zone basis viewed in the direction of the roller axis, with the various zones being heatable independently of each other at least in part. As such, differentiation across the width of the respective web is also possible if required.

For example, provision can be made for several burners distributed over the length of the roller.

According to an advantageous practical embodiment of the method according to the invention, the burner used is a catalytic burner by means of which the heat gas is generated through combustion of a fuel with air or oxygen.

A burner can thus comprise, for example, a carrier with a catalytic coating.

The fuel used can be particularly a fuel gas. Hence the burner can be fed, for example, with an in particular adjustable fuel gas/air mixture. In this case preferably fuel and air are fed to a mixing element upstream from the respective burner.

Preferably, supplied air is distributed by an air distributor among several burners.

The reaction or roller temperature is set or controlled preferably by means of the fuel/air mass flow ratio.

For example, the fuel gas mass flow and/or the fuel gas concentration in the air can be controlled. The control in question is performed preferably on a zone basis.

The fuel used can be, for example, hydrogen, hydrogen-rich gas (reformat) or natural gas.

According to another advantageous embodiment of the method according to the invention, a respective burner is arranged in an air-moving chamber and the air flowing over the burner is mixed with the burner waste gas. In this case the air flowing over the burner can be expediently mixed with the waste gas from the burner by means of a mixing element in the region of the end of the air-moving chamber facing the roller.

In this case the air flowing over the burner can be heated by said burner. It is also conceivable, however, for the burner to work adiabatically, meaning that there is no transfer of heat to the "bypass flow". The cold bypass flow is then mixed with the hot burner waste gas, resulting downstream from the mixing element in a mixture with an adequate temperature.

Such an embodiment makes sense in particular when using a fuel that reacts with air only at high temperatures. Natural gas, for example, does not react fully with air until in a higher temperature range (600 – 800°C).

The hot gas temperatures would be too high for the roller surface. Therefore, the hot gas is mixed with the "cold" bypass flow.

According to another advantageous embodiment of the method according to the invention, gas generated by means of a burner is mixed with supplied cold air in at least one mixing element in order to generate the heat gas for acting on the roller. In this case it is advantageous for the mass flow of the cold air supplied to the mixing element to be adjustable or controllable. Again, the burner is preferably supplied with air and fuel, particularly fuel gas. The fuel gas used in this case can be natural gas for example.

The hot gas generated by means of the burner is preferably distributed by a gas distributor among several mixing elements that are distributed over the length of the roller. The mass flows of cold air supplied to the various mixing elements are preferably individually adjustable or controllable at least in part.

Again, differentiation across the web width is thus possible in the latter case too.

The invention will be described in more detail in the following text using exemplary embodiments and with reference to the drawing, in which:

figure 1	is a schematic representation of a device for heating a roller with several catalytic burners that are arranged in succession in the direction of the roller axis and enable differentiation,
figure 2	is a schematic representation of another embodiment of the heating device in which the catalytic burners are arranged in each case in an air-moving chamber and the air heated by a respective burner is used to generate the heat gas which acts on the roller, and
figure 3	is a schematic representation of another embodiment in which the hot gas generated by means of a gas burner is distributed by a gas distributor among several mixing elements that are distributed over the axial length of the roller and are fed in addition with cold air, whereby the mass flows of cold air supplied to the various mixing elements are separately adjustable or controllable.

Figure 1 shows in a schematic representation a device 10 for heating a roller 12 that is used in particular for producing and/or finishing a web of material, particularly a paper web or paperboard web.

The roller 12 can be heated from the outside by means of the device 10 using a heated gas 14. For this purpose the device 10 comprises several burners 18 which are distributed over the length of the roller 12 and arranged near the roller surface 16.

The heat gas 14 emerging from the burners 18 acts accordingly on the surface 16 of the rotating roller 12.

In this case the roller 12 is heatable on a zone basis in the direction of the roller axis, thus enabling differentiation in the transverse direction of the web, meaning transverse to the running direction of the web.

In the case under consideration, the burners 18 are catalytic burners by means of which the heat gas 14 is generated through combustion of a fuel 20 with air 22 or oxygen.

Hence the burners 18 can each comprise a carrier 24 with a catalytic coating.

The fuel 20 provided can be in particular a fuel gas such as, for example, hydrogen (H_2) or hydrogen-rich gas (reformat). In principle, fuels other than hydrogen are also conceivable however.

An adjustable fuel gas/air mixture is fed in each case to the various catalytic burners 18. In this case a mixing element 26, to which fuel 20 and air 22 are fed, is installed respectively upstream from the burners 18.

Also, provision is made for an air distributor 28 by means of which supplied air 22 is distributed among the various catalytic burners 18.

In the case under consideration the reaction or roller temperature is adjustable or controllable on a zone basis by means of the respective fuel/air mass flow ratio. For this purpose provision can be made, for example, for controlling the respective fuel gas mass flow and/or the respective fuel gas concentration in the air.

The control or adjustment in question can be performed on a zone basis. In the case under consideration, control valves 32 are provided for this purpose in the various fuel supply lines 30 to the various mixing elements 26.

The various catalytic burners 18 are arranged respectively in a chamber 32 in which provision is also made respectively for the mixing element 26 that is installed upstream from the burner 18 in question. Using these chambers 32, heating gas 14 can be made to act on the roller 12 on a zone basis.

The embodiment of the heating device 10 presented in figure 2 differs from the one in figure 1 firstly in that the various catalytic burners 18 are arranged respectively in an air-moving chamber 34 and the air flowing over the burners 18 for generating the heat gas 14 for acting on the roller 12 is mixed with the burner waste gas.

In this case the air flowing over the burner can be heated by said burner. It is also conceivable, however, for the burner to work adiabatically, meaning that there is no transfer of heat to the "bypass flow". The cold bypass flow is then mixed with the hot burner waste gas, resulting downstream from the mixing element in a mixture with an adequate temperature. Such an embodiment makes sense in particular when using a fuel that reacts with air only at high temperatures. Natural gas, for example, does not react fully with air until in a high temperature range (600 – 800°C). The hot gas temperatures would be too high for the roller surface. Therefore, the hot gas is mixed with the "cold" bypass flow.

In this case provision is made in a respective air-moving chamber 34 in the region of its end facing the roller 12 for a mixing element 36 by means of which the air flowing over and heated by the catalytic burner 18 is mixed with the waste gas from the burner 18. The hot air emerging from the mixing elements 36 then acts accordingly on the roller 12.

Again, a mixing element 26 is installed respectively upstream from the catalytic burners 18 in order to generate the mixture of fuel and air supplied to the respective burner 18.

Natural gas, for example, is provided as fuel 20 in the case under consideration.

Otherwise, this embodiment again has at least substantially the same construction as the one in figure 1, mutually corresponding parts being assigned the same reference symbols. Again, differentiation across the web width is possible accordingly in the present case too.

Figure 3 shows a schematic representation of a further embodiment of the device 10.

In the case under consideration, the hot gas 40 generated by means of a gas burner 38 is distributed by a gas distributor 42 among several mixing elements 44 that are distributed over the length of the roller 12 and each supplied separately with cold air 46. The mass flows of cold air 46 supplied to the various mixing elements 44 are therefore adjustable or controllable on a zone basis. In the case under consideration, throttle valves 50 are provided for this purpose in the various fuel supply lines 48 to the various mixing elements 44.

The hot gas 40 supplied by the gas burner 38 is mixed with the cold air supplied through the cold air supply line 48 in question by means of the mixing elements 44, which again are arranged in a chamber 52, in order to generate the hot air 14 in question for acting on the roller 12.

As is evident in figure 2, a fuel gas 54, in this case natural gas for example, and air 56 are fed to the burner 38.

Again, the mass flows of cold air supplied to the various mixing elements 44 are adjustable or controllable on a zone basis by means of the throttle valves 50. Differentiation in the transverse direction of the web is thus possible in this case too.

List of reference numerals

10	Heating device
12	Roller
14	Heated gas, heat gas
16	Roller surface
18	Catalytic burner
20	Fuel
22	Air
24	Catalytic carrier with catalytic coating
26	Mixing element
28	Air distributor
30	Fuel supply line
32	Chamber
34	Air-moving chamber
36	Mixing element
38	Gas burner
40	Hot gas
42	Gas distributor
44	Mixing element
46	Cold air
48	Cold air supply line
50	Throttle valve
52	Chamber
54	Fuel gas
56	Air
X	Roller axis